

Some additional Wuchiapingian (Late Permian) ammonoids from the Southern Kitakami Massif, Northeast Japan

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Abstract. Permian ammonoids, *Dzhulfoceras* cf. *furnishi*, *D. sp.* and *Stacheoceras?* sp., are described from the Southern Kitakami Massif, Northeast Japan. The first two and the last were collected from the Lower and Middle Toyoman Series, respectively. The occurrence of *Dzhulfoceras* supports the previous correlation of the Lower Toyoman Series with the Wuchiapingian (Dzhulfian). This occurrence of *Dzhulfoceras* is the first record of the genus outside the Middle East and supports the conclusion that a close paleobiogeographic relationship existed between the Middle East and the Southern Kitakami in Late Permian time.

Key words: *Dzhulfoceras*, Equatorial Tethyan Province, Southern Kitakami Massif, *Stacheoceras*, Upper Permian, Wuchiapingian

Introduction

Fossils including ammonoids are rare in the black shale of the Upper Permian Toyoman Series in the Southern Kitakami Massif, Northeast Japan. However, the few ammonoids that have been recovered are useful biostratigraphic tools for dating the Toyoman formations and for estimating the paleobiogeographic situation of the massif. To date, sixteen species belonging to 11 genera of ammonoids have been described from the Toyoman Series (Bando, 1975; Ehiro, 1996; Ehiro and Bando, 1985; Ehiro *et al.*, 1986; Murata and Bando, 1975). The genera are *Pseudogastrioceras*, *Stacheoceras*, *Timorites*, *Cyclolobus*, *Eumedlicottia*, *Neogeoceras*, *Araxoceras*, *Vescotoceras*, *Eusanyangites*, *Xenodiscus* and *Paratirolites*. Based on these ammonoids, especially those belonging to the Cyclolobidae, Araxoceratidae, Xenodiscidae and Dzhulfitidae, the Lower to Middle and Upper Toyoman Series have been correlated with the Wuchiapingian (Dzhulfian) and Changhsingian (Dorashamian), respectively (Ehiro and Bando, 1985; Ehiro *et al.*, 1986; Ehiro, 1996). This ammonoid fauna is typical of the Equatorial Tethyan Province (Ehiro, 1997) and closely related to the Late Permian ammonoid faunas of South China and the Middle East.

In this paper two new occurrences of Late Permian ammonoids are described. Two specimens were collected from the Suenosaki Formation in the Utatsu area, and one

specimen came from the Toyoma Formation in the Motoyoshi area (Figure 1). Both occurrences indicate the Wuchiapingian horizon.

Late Permian ammonoids from Utatsu and Motoyoshi

In the Utatsu area, the uppermost Kanokuran (Middle Permian) to Middle Toyoman Suenosaki and Upper Toyoman Tanoura Formations are widely distributed (Ehiro and Bando, 1985). Two specimens of ammonoids described here as *Dzhulfoceras* cf. *furnishi* Ruzhencev and *D. sp.* were found in a calcareous nodule collected from a shale bed exposed along the Ishihama coast (see locality 3 of Ehiro and Bando, 1985). The fossil horizon belongs to the lower part of the Suenosaki Formation, which is correlated with the lower part of the Lower Toyoman Series. From this locality Ehiro and Bando (1985) and Ehiro *et al.* (1986) described some Wuchiapingian ammonoids, such as *Pseudogastrioceras* sp., *Stacheoceras iwaizakiense* Mabuti, *Timorites intermedius* (Wanner), *Araxoceras* cf. *rotoides* Ruzhencev, *A. sp.*, *Vescotoceras japonicum* (Bando and Ehiro) and *V. sp.*, and correlated the lower part of the Suenosaki Formation with the Wuchiapingian (Dzhulfian).

Dzhulfoceras belongs to the family Araxoceratidae and is indicative of Wuchiapingian age, although the genus ranges up to the Changhsingian. To date, three species of *Dzhulfoceras* have been described from the Upper Dzhulfian (*Vedioceras* bed) in Transcaucasia (*D. furnishi* Ruzhencev,

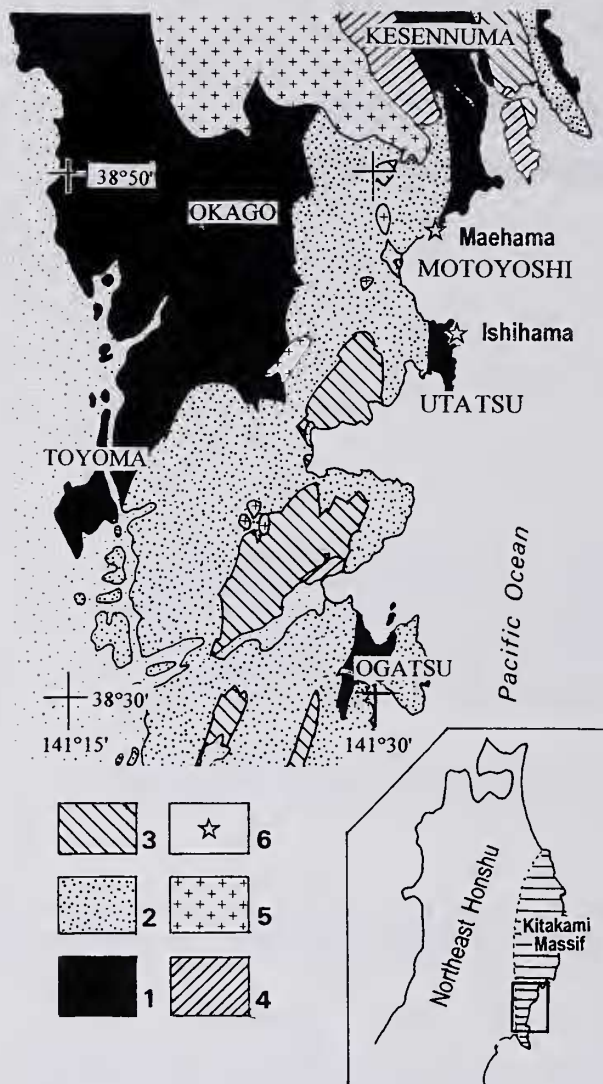


Figure 1. Map showing the fossil localities and geology of the southern part of the Southern Kitakami Massif. 1. Permian, 2. Triassic, 3. Jurassic, 4. Lower Cretaceous, 5. Early Cretaceous granitic rocks, 6. ammonoid localities.

D. inflatum Ruzhencev and *D. paulum* Ruzhencev; Ruzhencev, 1962, 1963) and from the Dorashamian (Unit 7 of the Hambast Formation) in Abadeh, Central Iran (*D. furnishi*; Bando, 1979). The Ishihama specimens of *Dzhulfoceras* described herein are the first recovery of the genus outside the Middle East. The *Dzhulfoceras* specimens show a close faunal relationship, in association with the previously reported ammonoids, to those of the Dzhulfian. The presence of *Dzhulfoceras* in South Kitakami supports the conclusion that the lower Suenosaki Formation is correlatable with the Wuchiapingian (Dzhulfian) (Ehro and Bando, 1985), and that the South Kitakami region belonged to the Equatorial Tethyan ammonoid province during Permian time (Ehro, 1997).

At the Maehama coast of the Motoyoshi area the Toyoma Formation consists mainly of massive black shale with a subordinate amount of lenticular thin sandstone beds. It is overlain unconformably by the Lower Triassic Hiraiso Formation. Murata and Bando (1975) reported an araxoceratid ammonoid, *Araxoceras* cf. *kiangsiense* Chao, from the black shale about 15 m below the boundary between the Toyoma and Hiraiso Formations. They correlated this part of the stratigraphic succession, which belongs to the Middle Toyoman Series based on the associated molluscan fossils, with the Dzhulfian. Later Zakharov (1986) compared this species to *Eusanyangites bandoi* Zakharov and Pavlov, which was recovered from the Wuchiapingian bed of Primorye, Far East Russia (Zakharov and Pavlov, 1986).

The present ammonoid specimen described here as *Stacheoceras?* sp. was collected from black shale exposed on the Maehama coast, at the same locality as Murata and Bando (1975). *Stacheoceras* is a long-ranging Permian genus and provides less precision in stratigraphic correlations.

Systematic descriptions

Superfamily Cycloloboidea Zittel, 1895
Family Vidrioceratidae Plummer and Scot, 1937
Genus *Stacheoceras* Gemmellaro, 1887

Type species.—*Stacheoceras mediterraneum* Gemmellaro, 1887.

Stacheoceras? sp.

Figure 2.3a-d

Material.—A relatively small incomplete specimen, IGPS coll. cat. no. 108551, collected from the Toyoma Formation exposed on the Maehama coast, Motoyoshi-cho, Motoyoshi-gun, Miyagi Prefecture.

Remarks.—The specimen consists of about one half volution of the body chamber and fragments of phragmocone with an estimated diameter of 21 mm. The involute conch with a narrow umbilicus is subglobular (Figure 2.3a-c). At the maximum estimated diameter the height, width and umbilical diameter are about 12.0, 15.5 and 5.0 mm, respectively. The surface of the body chamber bears fine but prominent transverse ribs with intercalary ones, which start at 1/3 height of the whorl. The body chamber is also marked by rather prominent transverse constrictions, which are nearly straight. The suture lines, only partly preserved and displaying parts of the lateral suture, consist of more than three pairs of rounded saddles and trifold lobes (Figure 2.3d). Their exact positions with respect to the venter are unknown, because they are on a fragmental phragmocone.

Involute subglobular shells with transverse ribs are characteristic for some genera which belong to the families including and not limited to the Marathonitidae, Perrinitidae, Vidrioceratidae and Cyclolobidae. Judging from the shape of the trifold lateral lobe of the suture, it could belong to *Waagenia* or more likely *Stacheoceras*. The present speci-

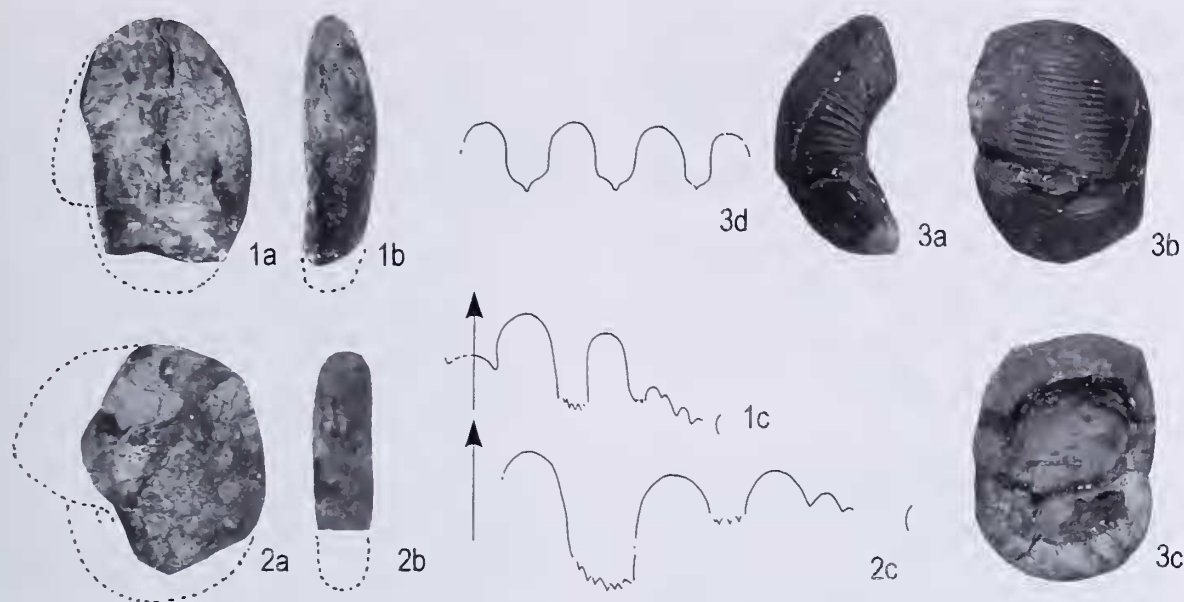


Figure 2. 1. *Dzhulfoceras* cf. *furnishi* Ruzhencev, IGPS coll. cat. no. 108552, lateral (1a) and ventral (1b) views, $\times 2.5$, and suture line (1c), $\times 7$. 2. *Dzhulfoceras* sp., IGPS coll. cat. no. 108553, lateral (2a) and ventral (2b) views, $\times 2.5$, and suture line (2c), $\times 7$. 3. *Stacheoceras?* sp., IGPS coll. cat. no. 108551, lateral (3a), ventral (3b) and dorsal (3c) views, $\times 1.6$, and a part of the lateral suture line, $\times 8$. Dotted lines show estimated conch outlines.

men is, however, too poorly preserved to identify it with confidence at the generic level and therefore the specimen is placed in *Stacheoceras* with strong reservations.

Superfamily Otoceratoidea Hyatt, 1900
Family Araxoceratidae Ruzhencev, 1959
Genus *Dzhulfoceras* Ruzhencev, 1962

Type species.—*Dzhulfoceras furnishi* Ruzhencev, 1962.

Dzhulfoceras cf. *furnishi* Ruzhencev, 1962

Figure 2.1a-c

Compare.—

Dzhulfoceras furnishi Ruzhencev, 1962, p. 99, pl. 5, figs. 1a, b, text-fig. 8a; Bando, 1979, p. 128, pl. 6, figs. 8a-c, 9a, b, text-fig. 6A.

Material.—A partly complete phragmocone, IGPS coll. cat. no. 108552, collected from the lower part of the Suenosaki Formation exposed along the Ishihama coast, Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

Descriptive remarks.—The specimen is a deformed phragmocone with an estimated diameter of 14 mm. The conch is involute and thinly discoidal, with a pinpoint umbilicus (Figure 2.1a, b). The compressed shell has nearly parallel, but slightly convex flanks. The venter and ventrolateral shoulders are rounded. No ornamentation is observed on the shell surface. The ceratitic suture consists of a moderately wide ventral lobe, large and high rounded ventrolateral saddle, large and deep first lateral lobe, moderately high second lateral saddle, relatively small and shallow

second lateral lobe and four pairs of small rounded saddles and pointed lobes (Figure 2.1c). Only the first and second lateral lobes are denticulate.

Based on the shell form, especially on the rounded shape of its ventrolateral part, and the form of the suture, the present specimen can be assigned with confidence to *Dzhulfoceras*. Among the species of the genus *Dzhulfoceras* it most closely resembles *D. furnishi* Ruzhencev in having nearly parallel sides of the shell. The present specimen is not sufficiently well preserved to allow a confident species assignment.

Dzhulfoceras sp.

Figure 2.2a-c

Material.—An incomplete phragmocone, IGPS coll. cat. no. 108553, collected from the lower part of the Suenosaki Formation exposed on the Ishihama coast, Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

Remarks.—The specimen is a small fragment of phragmocone of about one half volution with an estimated diameter of 14 mm. The conch is compressed, involute and thinly discoidal. The slightly convex sides are subparallel, and the venter and the ventral shoulders are rounded (Figure 2.2a, b). No ornamentation is observed on the shell surface. The suture line is partly preserved on the lateral part of the conch. It consists of a large and high rounded ventrolateral saddle, large and deep serrated first lateral lobe, moderately high rounded second lateral saddle, relatively small and shallow serrated second lateral lobe and more than two pairs of small rounded saddles and pointed

lobes (Figure 2.2c). The ventral suture is not preserved.

This specimen is assigned to *Dzhulfoceras*, judging from the shell shape and sutural outline. It is, however, impossible to assign the specimen to a species with confidence because of the poor state of preservation.

References

- Bando, Y., 1975: On some Permian Medicottidae from the Toyoma Formation in the Kitakami Massif. *Memoir of the Faculty of Education, Kagawa University, Series II*, vol. 25, p. 67-81.
- Bando, Y., 1979: Upper Permian and Lower Triassic ammonoids from Abadeh, central Iran. *Memoir of the Faculty of Education, Kagawa University, Series II*, vol. 29, p. 103-138.
- Ehiro, M., 1996: Latest Permian ammonoid *Paratiroilites* from the Ofunato district, Southern Kitakami Massif, Northeast Japan. *Transactions and Proceedings of the Palaeontological Society of Japan, New Series*, no. 184, p. 592-596.
- Ehiro, M., 1997: Ammonoid palaeobiogeography of the South Kitakami Palaeoland and palaeogeography of eastern Asia during Permian to Triassic time. *Proceedings of the 30th International Geological Congress*, vol. 12, p. 18-28.
- Ehiro, M. and Bando, Y., 1985: Late Permian ammonoids from the Southern Kitakami Massif, Northeast Japan. *Transactions and Proceedings of the Palaeontological Society of Japan, New Series*, no. 137, p. 25-49.
- Ehiro, M., Shimoyama, S. and Murata, M., 1986: Some Permian Cyclolobaceae from the Southern Kitakami Massif, Northeast Japan. *Transactions and Proceedings of the Palaeontological Society of Japan, New Series*, no. 142, p. 400-408.
- Gemmellaro, G. G., 1887: La fauna dei calcari con *Fusulina* della valle dei Fiume Sosio nella provincia di Palermo. *Giornale di Scienze Naturali et Economiche*, vol. 19, p. 1-106.
- Murata, M. and Bando, Y., 1975: Discovery of Late Permian *Araxoceras* from the Toyoma Formation in the Kitakami Massif, Northeast Japan. *Transactions and Proceedings of the Palaeontological Society of Japan, New Series*, no. 97, p. 22-31.
- Ruzhencev, V. E., 1962: Classification of the family Araxoceratidae. *Paleontological Journal*, no. 4, p. 88-103. (in Russian)
- Ruzhencev, V. E., 1963: New data about the family Araxoceratidae. *Paleontological Journal*, no. 3, p. 56-64. (in Russian)
- Zakharov, Yu. D., 1986: Type and hypotype of the Permian-Triassic boundary. *Memorie della Societa Geologica Italiana*, vol. 34, p. 277-289.
- Zakharov, Yu. D. and Pavlov, A. M., 1986: The first find of araxoceratid ammonoids in the Permian of east USSR. In: Zakharov, Yu. D. and Onoprienko, Yu. I. eds., *Permian-Triassic Events during Evolution of the North East Asia Biota*, p.74-85, Academiya Nauk SSSR, Vladivostok. (in Russian)